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The Fusion Evaluated Nuclear Data Library (FENDL)

Summary Report of an IAEA Consultants' Meeting
IAEA Headquarters, 1 – 4 August 2016

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August 2016

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ABSTRACT
The Consultants' Meeting on the Fusion Evaluated Nuclear Data Library (FENDL) was held at the IAEA Headquarters in Vienna from 1 to 4 August 2016. A summary of the presentations, discussions, actions and strategies for the future library versions and distributions are provided in this report.

August 2016

Contents

1. INTRODUCTION

Arjan Koning, head of the IAEA Nuclear Data Section, introduced the participants and described the overall goals of the FENDL programme, which is critical for fusion-relevant experiments and the ITER project. Ulrich Fischer was selected chairman of the meeting and Michael Fleming rapporteur. Andrej Trkov, the scientific secretary, explained that Michael Loughlin, the ITER Organisation representative, sent his apologies and would not be attending the meeting. This was noted as particularly unfortunate, as the FENDL library is primarily developed for fusion analysis which is largely focused on the ITER device which is under construction and due to be commissioned in the coming decade.

The agenda was modified to reflect this absence and the splitting of the presentation of Chikara Konno into six separate presentations with specific sub-topics. The meeting was agreed to include two full days of presentations with two further days to discuss the results, status of potential source files and agree both on the next FENDL release and future strategy.

2. PRESENTATIONS

2.1. Application tests of FENDL-3.1b to the IFMIF/ENS D-Li Neutron Source Facility, U. Fischer

D-Li neutron source facilities are integral to the plan to build a successful DEMO reactor, whether a full IFMIF, one-beam ENS or a DEMO-oriented DONES – the last of which is being designed under the EUROfusion PPPT programme. Work done at KIT has used the most recent FENDL-3.1b neutron data on D-Li neutron source facility simulations with comparisons against the previous simulations using FENDL-3.0/SLIB-R2. Simulations were performed using the McDeLicious-11 code which uses bespoke deuteron-lithium reaction data for the neutron source simulation. Attempts to use built-in models, as available e. g. in MCNPX, proved unsatisfactory. The McDeLicious-11 data notably includes exothermic neutron-producing reactions which increase the maximum energy of the neutron source up to 55 MeV. The D-Li reaction data and McDeLicious-11 code and the reaction data are available through the EUROfusion consortium to other participants. The code was used to simulate irradiation of Eurofer specimens in the High Flux Test Module (HFTM) of the global IFMIF Test Cell Model from 2010. This model had been used in the frame of the FENDL-3 CRP to benchmark FENDL-3/SLIB data against the previous IFMIF calculations using LANL-150 and INPE data evaluations as compiled in the so-called “IFMIF standard library” used then for IFMIF nuclear analyses. The FENDL-2.1 could not be used for these analyses due to the *complete lack of data* above 20 MeV.

The FENDL-3.1b data library, as provided on the FENDL-3 web site of the IAEA/NDS, could be used without problems and no error messages in the MC calculation (a previous version had produced “bad troubles” error messages due to the Cr data). Neutron flux distribution and spectra calculated with FENDL-3.1b and the preliminary FENDL-3/SLIB R2 data library agree within the statistical error of the Monte-Carlo calculations. The photon flux shows a slight increase in the order of 1 to 2% with the FENDL-3.1b data. This increase in photon flux results in a similar slight increase of the heating rate of the Eurofer specimens. Tritium and hydrogen gas production increases significantly (by 20 to 25%) when using the total production cross-sections, i. e. MT=203 (p), 204 (d), and 205 (t). The total He production increases by ca. 5% with the MT=206 (^{3}He) and MT=207 (^{4}He) total gas production cross-sections. The neutron induced damage rate in iron increases by ca. 12% with the FENDL-3.1b data. All of these results are supported by the cross-sections extracted from the ACE library used in the calculations and documented in a separate set of slides. The new FENDL-3.1b cross-sections show significant improvements over the SLIB data and are judged more reliable. It is thus concluded that FENDL-3.1b can be used further-on as standard data library for IFMIF/ENS nuclear analyses.

Re-analysis of the HCPB and HCLL mock-up Experiments with state-of-the-art nuclear data libraries

Tritium breeding mock-up test modules have been constructed and irradiated, with measurement and analyses performed at multiple European laboratories including KIT, TUD, FNG and VKTA. These were simulated in previous work using FENDL-3.0 and other libraries including JEFF-3.2 and ENDF/B-VII.1. New analyses were performed using FENDL-3.1b as an additional V&V exercise. Two very different experiments were considered based on the Helium Cooled Pebble Bed (HCPB) design and the Helium Cooled Lithium Lead (HCLL) designs.

The HCPB experimental results showed general disagreement with the shape of 14 MeV peak which survives the breeder module layers, as well as a general under-prediction of the neutron flux in several regions by 10-15%. These result in a corresponding under-prediction of tritium production, which sensitivity analyses have shown to be due to the beryllium evaluation. A revised evaluation for beryllium is envisaged.

The HCLL experimental results were generally in much better agreement with the calculations. Notably the experiment does not feature beryllium, as lead provides the neutron multiplication.

2.2. Recent evaluation activity/progress in the JENDL project , S. Kunieda

S. Kunieda presented an overview of the Japanese evaluation projects which have included a newly released (2015) JENDL-4.0 high energy extension file named JENDL-4.0/HE. This includes 130 neutron induced files with cross section data, differential elastic scattering and double differential for various other reactions including proton, deuteron, tritium and ^{3}He production. This library includes 133 incident proton files. The CCONE code is used for the production of the high energy double differential and residual production data, employing a clustering pre-equilibrium model with a globally defined pick-up radius which is empirically set by the evaluator. The emitted particle spectra for proton-induced reactions was presented in particular, showing a clear improvement in the neutron production data for ^{7}Li. It was agreed by all that these are a significant improvement over the existing proton data within FENDL-3.1b and that they should be proposed for adoption.

Ongoing work for deuteron-induced reactions is done using the DEURACS code, which employs three separate methods: (1) CCONE for statistical reactions, (2) CDCC for 3 body break-up reactions and (3) a Glauber model for stripping reactions. Example evaluations for carbon and scandium were shown. The JENDL-5.0 library is being planned with an expected release date in approximately 2021. Examples of threshold reaction channels around 14 MeV were shown, as well as new covariance methods which include correlation matrices on the emitted particle angular distributions. New isotopic carbon and ^{20}Ne evaluations are also anticipated.

2.3. Analyses of iron and concrete shielding experiments at JAEA/TIARA with JENDL/HE-2007, ENDF/B-VII.1 and FENDL-3.0, Ch. Konno

The first of C. Konno’s presentations summarised work in comparing and probing the differences between FENDL-3.0, ENDF/B-VII.1 and the JENDL/HE-2007 files for shielding experiments performed at the JAEA/TIARA. This follows on and extends 2012 work performed by Dr. Kondo at KIT, notably including 65 MeV data that were not considered in the previous work. MCNP-5.14 was used with the experimentally determined neutron source and the official release of FENDL-3.0. With the iron experiments, the on-beam-axis spectra at various thicknesses show an overestimation with ENDF/B-VII.1. Manual modification of the subsections of the files were performed to identify the components that were responsible for the observed differences. It was found that replacement of the ENDF/B-VII.1 high energy (20 MeV+) non-elastic scattering with FENDL-3.0 data resolved the discrepancies. The concrete experiments were tested in the same manner, with both ENDF/B-VII.1 and FENDL-3.0 over-predicting the fluxes. Oxygen was identified as the culprit with three permutation files tested: (1) elastic data from JENDL/HE-2007, (2) MT=5 data from JENDL/HE-

2007 above 20 MeV and (3) a combination of both (1) and (2). The third option showed the best agreement and there was a consensus that a new oxygen evaluation should be considered for future releases.

Problems in FENDL-3.0

Several verification tests were performed on the FENDL-3.0 library which included the deterministic libraries using the ANISN Sn code. The results from a 1m sphere with 50 MeV point source were checked against equivalent MCNP calculations. A large discrepancy was found and identified as a lack of energy angular distribution data for non-elastic scattering in the MATXS of FENDL-3.0, which was corrected with re-processing of the data using an updated version of the NJOY code. Issues with KERMA and DPA values were found for several nuclides, particularly in the lower-energy regions. Many were determined to be due to processing issues arising from legacy NJOY versions which are corrected in the NJOY versions currently used at JAEA and the IAEA. It was also specified that the issue regarding KERMA and DPA of ^{15}N was due to a wrong Q value of (n,α) reaction in the source nuclear data. Drastically large KERMA and DPA data of several nuclei in the lower-energy regions were due to huge gas production cross section data in the low neutron energy. It was agreed that the huge gas production cross section data in low neutron energy should be checked and revised as necessary.

Revision of FENDL-3.1

FENDL-3.1 now has had three versions, 3.1, 3.1a and 3.1b. However, the ^{16}O data above 20 MeV were not revised because it was not an issue in connection with data processing but a problem with the evaluated source data. The correction of several problems referenced in the previous presentation were presented, including the update of NJOY, reprocessing of MATXS data and the correction of a ^{15}N Q value. Some differences between FENDL-3.1b and other well-known libraries remain, particularly for KERMA and DPA of nuclei with huge gas production cross section in the lower-energy regions. These require additional attention for future releases and were determined to be largely stemming from old TENDL-2010 evaluations, including S, K, Lu, Pt and Bi.

ACE file problem of ^{116}Sn and ^{117}Sn in FENDL-3.1b

The IAEA had not produced ACE files for ^{116}Sn and ^{117}Sn in FENDL-3.1b due to processing issues which remain in NJOY-2012.50. Depending on the operating system and compiler, different warning levels were produced, for example not generating a fatal error due to an array overflow on OS X gfortran. The root cause was determined to be two near-identical gamma lines which were not treated as distinct in the NJOY processing. A new patch from the IAEA has been made available and is distributed through the OECD-NEA (https://www.oecd-nea.org/dbprog/njoy-links.html). This corrects the problem, although requiring unofficial NJOY patching which should be applied cautiously. It was agreed that additional discussion with NJOY developer(s) to officially correct this problem should be pursued.

New comments on the KERMA and DPA data in FENDL-3.1b

The IAEA has adopted kinematic approaches for KERMA in ACE and MATXS files which was not adequate for nuclei without consistent energy balance data. For nuclei with consistent energy balance data, most of the KERMA factors in the official ACE file of FENDL-3.1b seemed to have no issues. However, it was found that the kinematics and energy-balance KERMA factors of ^{39}K and ^{40}K were very different for incident neutron energy below a few keV. An issue with non-threshold gas production of mt103 and mt107 data in file6 was brought up, as these were not included within the DPA and KERMA values in the presentation. It was agreed that this is likely due to some processing issues within the HEATR module of NJOY and will be verified, with C. Konno agreeing to perform verification checks on the updated KERMA values included in the next FENDL release, which will include an update of the TENDL files.

Additional comments on the KERMA and DPA data in FENDL-3.1b.

Several DPA data in nuclear data libraries with data above 20 MeV tend to have a non-negligible discontinuity at 20 MeV. This issue was checked for FENDL-3.1b. The DPA data of ^{19}F, ^{23}Na, ^{24}Mg, ^{25}Mg, ^{26}Mg, ^{35}Cl, ^{37}Cl, ^{36}Ar, ^{38}Ar, ^{40}Ar, ^{40}Ca, ^{42}Ca, ^{43}Ca, ^{44}Ca, ^{46}Ca, ^{48}Ca, ^{46}Ti, ^{47}Ti, ^{48}Ti, ^{49}Ti, ^{50}Ti, ^{51}V, ^{59}Co, ^{175}Lu, ^{176}Lu, ^{181}Ta, ^{185}Re, ^{185}Re, ^{187}Re, ^{190}Pt, ^{192}Pt, ^{194}Pt, ^{195}Pt, ^{196}Pt, ^{198}Pt, ^{197}Au, ^{235}U and ^{238}U in FENDL-3.1b contain a large drop 20 MeV. The DPA data of ^{52}Cr also possess an apparent under-prediction in the energy region below 20 MeV. The KERMA data of ^{6}Li has a dip from 20 to 30 MeV and those of ^{160}Gd were negative from 18 to 20 MeV, although they were deduced with the kinematics approach. These issues should be acted upon before the next FENDL release. The KERMA and DPA of ^{39}K in TENDL-2015 were also shown. Because ^{39}K data in TENDL-2015 have mt103 and mt107 data in file6, the kinematics KERMA and damage energy production data of ^{39}K data in TENDL-2015 have a processing problem pointed out in this meeting by C. Konno.

2.4. The Impact of Neutron and Photon Cross Section Libraries on ITER Neutronics Calculations, M. Sawan

A one-dimensional, layered model which represents the inboard and outboard components of an ITER-like device was simulated using MCNP to efficiently test the FENDL-3.0/R4 library against the previous FENDL-2.1. Most notably the neutron spectra in regions behind the thick water-cooled blanket were harder and the total flux greater, producing increases in nuclear heating, radiation damage, and gas production. It was also noted that a lack of some total gas production reactions in FENDL-2.1 resulted in significant increases in the tallied gas production values when FENDL-3.0 is used. Switching to FENDL-3.0 produces magnet heating values that are greater, *by up to 6%*, compared to those obtained with FENDL-2.1. Similar calculations were performed with a full, three-dimensional model of a 40-degree sector of ITER with detailed CAD model of Blanket Module #1 using DAG-MCNP. These showed the same trends as in the one-dimensional case, supporting those conclusions in a more robust model. It was noted that FENDL-2.1 data libraries are still routinely employed for ITER calculations of TF coil heating. It is *strongly* recommended that FENDL-3 be used in ITER nuclear analyses.

Photon libraries were also tested, as there are several provided in the latest MCNP distributions including mcplib04, mcplib05, mcplib84 and eprdata12. These were tested with different MCNP-5/6 versions and FENDL libraries to determine what differences exist. Since photon heating is a significant (~90%) component of nuclear heating for structural materials, this was used as the test value. One-dimensional tests with the different data libraries demonstrated that the mcplib05 data under-predicts values and is not recommended. This was confirmed through correspondence with the MCNP developers. The conclusion was that eprdata12 is recommended with MCNP6 while mcplib84 is recommended for MCNP5 simulations.

2.5. From Experiments and Technologies to Applications: FENDL Perspectives, M. Fleming

Work at the UKAEA has focused on employing general-purpose nuclear data for simulations in multiple applications, including radiation transport, activation/inventory, materials simulation, etc. The FISPACT-II code system employs all available ENDF6-formatted nuclear data with particular attention on the TENDL data which accommodates all of the simulation needs. Several verification and validation programmes have been completed which cover: (1) fusion decay heat, (2) fission decay heat, (3) s-process nucleosynthesis, (4) statistical checks on global libraries, (5) thermal, resonance integral and MACS verification, (6) integral fusion and accelerator benchmarking and (7) activation/materials handbooks. These have culminated in a series of UKAEA/CCFE reports. Special attention has been placed on materials simulation data which can be generated from the full emitted particle data included in the TENDL files. These have been processed through a utility code *spectra-pka*. The material, isotopic and time-dependence of these data were highlighted. Recommendations were drawn from experience in fission benchmarking which should be acted upon with fusion: (1)

self-shielding corrections in energy and during evolution of materials under high flux and therefore transmutation (2) decay data gamma energy corrections for lack of high energy beta feeding data. Problems with the legacy EAF data which comprises the FENDL/A files were highlighted, temperature-dependence, self-shielding, uncertainties, correlations, emitted data, etc. It was agreed that these files should be updated with current and/or future TENDL releases. The out-of-date TENDL files within the transport FENDL libraries were also discussed in relation to this work and other presentations, with agreement to update these to the most up-to-date files. A discussion followed on the details of the activation file description for the next FENDL releases and the time-frame for this work, which was carried on in subsequent sessions.

2.6. Evaluation of ^{56}Fe from thermal to 2 MeV, L. Leal

A set of new measurements for ^{56}Fe have been used by L. Leal, including high-resolution transmission measurements at RPI which extend to 5 MeV, inelastic measurements from IRMM/GELINA and RPI angular scattering data. These have been prepared for use with the SAMMY R-matrix code to perform new evaluations. Results from the most recent evaluations were presented with comparisons against the full set of data used. These showed impressive agreement in various datasets with some unresolved discrepancies depending on the sample, techniques and possibly the quality of the data. Averaged angular distribution data derived from the same analysis were shown with good agreement. Several comments for future needs were made, including the current ^{54}Fe resonance range which extends only to 700 keV, the need for DDX scattering and inclusion of the first inelastic.

A specific energy ‘window’ around 25 keV for the ^{56}Fe capture was brought up due to its importance for specific criticality benchmarks including ZPR-9/34. Previous analyses found significant sensitivity for this specific energy, which includes a direct capture component not generated in the resonance analysis. It was agreed that a variety of perturbed direct capture contributions should be used to generate a set of files for the IAEA to perform benchmarking studies. The ultimate design is to correct discrepancies in criticality benchmarks sensitive to iron.

3. DISCUSSION

Following the presentations, it was agreed that the future FENDL releases should consider new source evaluations for several nuclides and this would constitute a new version number: FENDL-3.2. The scope of this work will include updates of the TENDL-2010 and TENDL-2012 data to TENDL-2015, adoption of the best ^{16}O evaluation, adoption of the JENDL-4.0/HE proton-induced ^{7}Li and correction of any processing errors that have been identified in the current verification checks. The schedule of actions supports the agreed timeframe for a testing release in late September and public release in early October.

Following the upcoming releases of ENDF/B-VIII and JEFF-3.3, a new FENDL version is planned which will draw upon these modern evaluations. The JENDL-4.0/HE files will also be used for potential new source evaluations and updates of the TENDL-2015 files to the most recent TENDL available, including both neutron and charged particle files. The activation library will be significantly upgraded by replacing the EAF-2010 files with the most recent TENDL data. These files will be based on the ‘s60’ data form which extends individual channel descriptions up to 60 MeV with full covariance data. The MF6 recoil data will be translated into the equivalent MF10 MT5 data and then removed for the activation file distribution. This release will depend on the timeframe for the other major library releases which are not precisely known, but it is anticipated for an early 2018 testing version followed by a public release in 2019.

A bullet-point summary of the agreed strategy is included below:

- No more 3.1 modifications. New version will include source modification and constitute a 3.2 version

- **FENDL-3.2**
    - O16 evaluation
    - TENDL-2010/12 -> TENDL-2015
    - FENDL/A unchanged
    - Proton ^{7}Li
    - Investigation and potential fixing of Cr, without re-evaluation
    - Gas production due to processing will be corrected, those from missing channels will be in 4.0
    - Minor corrections as discussed, restricted to modifications of existing files to correct clear errors
    - Timescale
        - Delivery of benchmarks from JAEA in late August, early September
        - Estimated distribution for testing end of September
        - Public release, announcement in October 2016

- **FENDL-4.0**
    - Update to new major neutron libraries, including ENDF/B-VIII, JEFF-3.3, JENDL-4.0/HE and CIELO
    - JENDL-5.0 will be considered when it becomes available, beta is anticipated in 2019
    - Update will include incident neutron, proton and deuteron data
    - Comparison with released p-induced and upcoming Japanese d-induced data
    - Activation library to be updated to most recent TENDL
        - S60 files including all individual channels up to 60 MeV with covariance data
        - MF6 used for MF10 (60+ MeV) creation and then removed
        - Potentially to include MF3 300-500 series, dpa, kerma
        - Final library to include exclusively MF1, 2 (dummy), 3, 10, 33, 40
        - Resonance range portion of the 44-group SCALE structure proposed for resonance range covariance, complemented with TENDL covariance structure above
        - ACE file in dosimetry format
    - Update of TENDL-2015 to most up-to-date TENDL version
    - Timescale
        - Requires releases of ENDF/B, JEFF and TENDL versions and dependent on those timeframes
        - Expected beta testing release in early 2018
        - Expected public release in 2019

4. ACTION ITEMS

Actions and *tentative* deadlines are listed below

1. **All participants:** Obtain clearance from participants' management and make presentation slides (as pdf) available for distribution through the IAEA FENDL website [12 Aug. 2016]
2. **AT, UF:** Investigate underestimation of cross sections in the MeV region (particularly ^{52}Cr, as shown in DPA) [1 Sept. 2016]
3. **AT:** Investigate the gas production, particularly ^{4}He, for chromium and any potential processing or evaluation issues [1 Sept. 2016]
4. **SK:** Provide the JENDL-4.0/HE evaluations for proton-induced cross sections for ^{7}Li [4 August 2016] **optional: and identify any other nuclides (particularly light Z) which may be suitable for adoption* [19 Aug. 2016]
5. **CK, UF:** Recalculate the TIARA concrete and FNS liquid O benchmarks using the new CIELO ^{16}O evaluation and share findings for decision on new FENDL ^{16}O [5 Sept. 2016]
    a. **CIELO: https://www-nds.iaea.org/CIELO/**
    b. **JEFF-3.3 Leal test file:** Provided by UF
6. **AT:** Incorporate the ^{16}O file demonstrated to be best through benchmarking by CK [7 Sept. 2016]
7. **AT, AK:** Obtain, process and integrate replacement files from TENDL-2015 for the transport FENDL data for all drawn from TENDL-2010/12 [19 Aug. 2016]
8. **CK:** Verify DPA and KERMA values for all of the newly adopted TENDL-2015 data to be included in next FENDL release [7 Sept. 2016]
9. **AT:** Distribute the ACELST FORTRAN source for verification tests by participants [3 Aug. 2016]
10. **AT:** Modify FENDL front page linked files to reflect naming of the current FENDL library, add warning statements on previous FENDL pages and change linked filenames [4 Aug. 2016]
11. **LL:** Incorporate direct capture in a new resonance evaluation of ^{56}Fe with an aim to improve the results for ZPR-9/34 by up to 1000 pcm. This will improve results for criticality safety applications. This task will be performed in collaboration with Andrej Trkov of the IAEA NDS, who will perform benchmarking calculations using the new evaluation(s) [15 Sept. 2016]
12. **MF:** Script comparison of TENDL-2015 and FENDL-3.1b gas production [10 Sept 2016]
13. **AT:** Verify availability of gas production cross sections in the FENDL-3.1b [30 Sept 2016]
14. **MF:** Clarification on methods to translate MF6 data of TENDL into MF10 [18 Aug 2016]
15. **MS:** Recalculate the 1D and 3D ITER benchmarks using the latest releases of FENDL-3.1b, and future updates [15 Oct 2016]
16. **AT:** Inform the ITER Organisation, [*guenter.janeschitz@iter.org* – Head of the Nuclear Integration Unit] on the status of FENDL and V&V results [30 Sept. 2016], specifically noting:
    a. Impact on nuclear heating of TF coils
    b. Gas production and lack of data within FENDL-2.1
17. **AT:** Correct label of ^{13}C evaluation in FENDL-3.1b and ENDF/B-III to JENDL/HE-2007 for zirconium and niobium isotopes JENDL-3 to JENDL/HE-2007 for molybdenum isotopes [10 Aug. 2016]
18. **AT:** Remove or alter the labels of the p-induced FENDL-3.1b [25 Aug. 2016]

IAEA 60 Years Atoms for Peace and Development

Consultants' Meeting on the

FENDL Library

IAEA Headquarters, Vienna, Austria
1-4 August 2016
Meeting Room VIC MOE67

Preliminary AGENDA

Monday, 1 August

09:00 - 09:30 **Registration** (IAEA Registration desk, Gate 1)

09:30 - 10:15 **Opening Session**

Welcoming address and Introduction – A. Koning, SH-NDS
Introduction – A. Trkov
Election of Chairman and Rapporteur
Adoption of Agenda
Administrative matters

10:15 - 12:30 **Presentations by participants (about 45 min each)**

1. U. Fischer:
   - *Application tests of FENDL-3.1b to the IFMIF/ENS D-Li neutron source facility*
   - *FENDL-3.1b benchmark tests on the HCPB and HCLL breeder blanket mock-up experiments*

12:30 – 14:00 ***Lunch***

14:00 – 17:30 **Presentations by participants (cont'd)**

2. S. Kunieda: *Recent evaluation activity/progress in the JENDL project*
3. Ch. Konno: *Problems on FENDL-3.0 and Review of FENDL-3.1b*
   - *Analysis of iron and concrete shielding experiments at JAEA/TIARA with JENDL/HE-2007, ENDF/B-VII.1 and FENDL-3.0* (30 min)
   - *Problems in FENDL-3.0* (30 min)
   - *FENDL-3.1b test* (15 min)
   - *ACE file problem of ^{116}Sn and ^{117}Sn in FENDL-3.1b* (10 min)
   - *New comments on KERMA factor and DPA cross section data in FENDL-3.1b* (10 min)

Coffee breaks as needed

Tuesday, 2 August

09:00 - 12:30 Presentations by participants (cont'd)

4. M. Sawan: *The Impact Of Neutron and Photon Cross Section Libraries on ITER Neutronics Calculations*
5. M. Fleming: *From Experiments and Technologies to Applications: FENDL Perspectives*

12:30 – 14:00 Lunch

14:00 – 17:30 Presentations by participants (cont'd)

6. L. Leal: *Evaluation of ^{56}Fe from Thermal to 2 MeV*
7. M. Loughlin: ?

Coffee breaks as needed

19:00 Dinner at a restaurant (see separate information sheet)

Wednesday, 3 August

09:00 - 12:30 Round table discussion

Discussions on the status and future needs of nuclear data for fusion

12:30 – 14:00 Lunch

14:00 – 17:30 Round table discussion (cont'd)

Drafting of the Summary Report and Action List

Coffee breaks as needed

Thursday, 4 August

09:00 - 17:00 Drafting of the summary report

Finalisation of the Summary Report and Action List

17:00 Closing of the meeting

Coffee and lunch break(s) in between

Consultants' Meeting on the

FENDL LIBRARY

1 – 4 August 2016
IAEA, Vienna, Austria

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